

## **APPENDIX B**

# **SUMMARY OF THE WASTE MANAGEMENT PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT AND ITS USE IN DETERMINING HUMAN HEALTH IMPACTS AT TREATMENT SITES**

The *Final Waste Management Programmatic Environmental Impact Statement* (WM PEIS) (DOE 1997) is a nationwide study examining the environmental impacts of managing five types of radioactive and hazardous wastes that result primarily from nuclear defense activities – the development, production, and testing of nuclear weapons at a variety of sites located around the United States. The five waste types are the following: low-level mixed waste, low-level waste, transuranic (TRU) waste, high-level waste, and hazardous waste.

For each waste-type system, facilities are needed to treat, store, and/or dispose of the waste. In the WM PEIS, the Department of Energy (DOE or the Department) has not only examined, in an integrated fashion, the impacts of complex-wide waste management for each waste type but also the specific cumulative impacts for all the waste facilities at a given site. The WM PEIS provides information on the impacts of various siting alternatives, which DOE will use in deciding where to locate additional treatment, storage, and/or disposal capacity for each waste type. However, the location of a facility at a selected site will not be decided until completion of a subsequent sitewide or project-specific National Environmental Policy Act (NEPA) review.

### **B.1 RELATIONSHIP OF DIFFERENT LEVELS OF NEPA DOCUMENTS**

In accordance with DOE NEPA regulations, three types of NEPA documentation may be prepared: programmatic, sitewide, and project-level. Programmatic documents, such as the WM PEIS, provide environmental input into decisions on broad agency actions, such as the adoption of new plans, programs, and policies to guide future actions. Sitewide NEPA documents, such as this document (SEIS-II), provide the opportunity for considering changes in the overall operating mode of a DOE site, including mission change, and provide a current environmental baseline at the site. Project-level NEPA documents evaluate the impacts of a specific project at a specific location on a site and are intended to provide environmental input into the manner in which the facility should be constructed and operated. Sitewide NEPA documents, which evaluate projects that could be implemented in the near-term at a site, may also serve as project-level NEPA documents for specified projects.

### **B.2 WASTE MANAGEMENT DECISIONS TO BE MADE BY DOE**

The WM PEIS is intended to provide environmental information to assist DOE in determining where to consolidate waste and where it should modify existing waste management facilities or construct new facilities. The TRU waste management facilities proposed in the WM PEIS are treatment and storage facilities. DOE needs to identify sites for waste management facilities in order to protect public health and safety, comply with federal law, and minimize adverse effects to the environment. If sites are selected for TRU waste treatment and storage facilities, DOE intends

to select the sites using the WM PEIS analysis but will not select the level of treatment needed. Treatment level decisions will be made using SEIS-II analyses. Specific locations for the waste management facilities within a site will be selected on the basis of subsequent sitewide or project-level NEPA documents.

### **B.3 OVERVIEW OF THE WM PEIS TRU WASTE ANALYSES**

SEIS-II refers to relevant information, primarily concerning treatment sites, from several documents, including the *Title 40 CFR Part 191 Compliance Certification Application for the Waste Isolation Pilot Plant* (DOE 1996b), the *Resource Conservation and Recovery Act (RCRA) Part B Application* (DOE 1996a) and the WM PEIS (DOE 1997); SEIS-II updates and scales information with more recent information from these other documents. The following sections present an overview of information in the WM PEIS that is relevant to SEIS-II.

#### **B.3.1 TRU Waste**

TRU waste analyzed in the WM PEIS considers both contact-handled (CH) TRU and remote-handled (RH) TRU waste placed in retrievable storage across the DOE complex since 1970 and projected to be generated for 20 years. For the purposes of WM PEIS analyses, DOE included the small amount of nondefense TRU waste.

In addition, approximately 60 percent of the TRU waste also contains hazardous constituents as defined by the Resource Conservation and Recovery Act (RCRA); this waste is called TRU mixed waste. For purposes of the WM PEIS analyses, DOE assumed that the entire inventory of TRU waste was TRU mixed waste.

Management activities associated with TRU waste that are discussed in the WM PEIS include (1) retrieving TRU waste from storage and transporting it to a treatment facility; (2) sorting and treating the TRU waste as appropriate, packaging the waste, and certifying the waste for shipment to the Waste Isolation Pilot Plant (WIPP) for disposal; (3) storing certified waste; and (4) transporting the TRU waste to WIPP for disposal. For all of its alternatives except its no action alternative, the WM PEIS assumed that TRU waste would be disposed of at WIPP.

#### **B.3.2 TRU Waste Generator Sites and Inventories**

Sixteen sites are identified in the WM PEIS that have or are expected to generate or manage TRU waste.

Major sites identified in the WM PEIS include the following:

- Argonne National Laboratory-East (ANL-E) near Chicago, Illinois
- Hanford Site (Hanford) at Richland, Washington
- Idaho National Engineering and Environmental Laboratory (INEEL) near Idaho Falls, Idaho
- Lawrence Livermore National Laboratory (LLNL) near San Francisco, California
- Los Alamos National Laboratory (LANL) at Los Alamos, New Mexico

- Mound Plant (Mound) at Miamisburg, Ohio
- Nevada Test Site (NTS) near Las Vegas, Nevada
- Oak Ridge Reservation (ORR) at Oak Ridge, Tennessee (identified as Oak Ridge National Laboratory [ORNL] in SEIS-II)
- Rocky Flats Environmental Technology Site (RFETS) near Golden, Colorado
- Savannah River Site (SRS) at Aiken, South Carolina.

Identified as smaller generators are the following:

- Energy Technology Engineering Center (ETEC) at Canoga Park, California
- Lawrence Berkeley Laboratory (LBL) at Berkeley, California
- Paducah Gaseous Diffusion Plant (PGDP) at Paducah, Kentucky
- Sandia National Laboratories (SNL) at Albuquerque, New Mexico
- University of Missouri at Columbia (U of Mo), Missouri
- West Valley Demonstration Project (WVDP) at West Valley, New York. The small amount of waste from this site originated from commercial reprocessing of spent nuclear fuel and so is not defense related.

The WM PEIS analyzes the potential environmental impacts for managing approximately 67,000 cubic meters (2.4 million cubic feet) of retrievably stored CH-TRU waste and about 1,700 cubic meters (60,000 cubic feet) of retrievably stored RH-TRU waste. Approximately 95 percent of the existing CH-TRU waste and RH-TRU waste is stored at Hanford, INEEL, LANL, ORR, RFETS, and SRS.

An additional 47,000 cubic meters (1.7 million cubic feet) of CH-TRU waste and 17,000 cubic meters (600,000 cubic feet) of RH-TRU waste was assumed to be generated over the next 20 years (excluding TRU waste that would result from environmental restoration activities), for a total of about 132,000 cubic meters (4.7 million cubic feet) of retrievably stored TRU waste. The inventory and annual generator rates for the WM PEIS were obtained from the *Interim Mixed Waste Inventory Report* (DOE 1993) and the *Integrated Data Base for 1992* (DOE 1992). Updated information on waste volumes was used for Hanford and SRS. Updated data for TRU waste were taken from two sources: the *Mixed Waste Inventory Summary Report* (MWIR 95) (DOE 1995a) and the *Transuranic Waste Baseline Inventory Report, Revision 2* (BIR-2) (DOE 1995b), with most of the new information taken from MWIR 95. [Table B-1](#) presents the waste volumes as used in WM PEIS risk calculations; this table is the same as WM PEIS Table 8.1-1. SEIS-II analyses differ slightly from the WM PEIS regarding TRU waste volumes, years of generation, and the number of sites producing waste as discussed in Appendix A. These

changes presented in SEIS-II were necessary to evaluate the most recent information and Departmental planning assumptions that were available for analysis. For example, SEIS-II waste volumes include environmental restoration wastes in the Additional Inventory; SEIS-II also assumes a 35-year operations period; and the number of TRU waste sites was expanded to include smaller sites captured in the updated inventory.

**Table B-1**  
**Transuranic Waste Volumes of the WM PEIS (cubic meters)**

Site <sup>a</sup>	CH-TRU Waste			RH-TRU Waste			Total
	Inventory	20-Year Projected Generation	Estimated Inventory + 20 Year Generation	Inventory	20-Year Projected Generation	Estimated Inventory + 20 Year Generation	
ANL-E	15	940	960	---	340	340	1,300
ETEC	0.02	---	0.02	---	---	---	0.02
Hanford	12,000	24,000	36,000	200	15,400	16,000	52,000
INEEL	38,000	280	38,000	110	500	610	39,000
LANL	8,200	2,500	11,000	79	10	89	11,000
LBL	0.8	0.2	1	---	---	---	1
LLNL	200	1,500	1,700	---	---	---	1,700
Mound	274	1,200	1,500	---	---	---	1,500
NTS	610	---	610	---	---	---	610
ORR	670	360	1,000	1,300	360	1,700	2,700
PGDP	14	---	14	---	---	---	14
RFETS	1,500	4,800	6,200	---	---	---	6,200
SNL	1	---	1	---	---	---	1
SRS	5,100	11,500	16,600	---	---	---	16,600
U of Mo	---	2	2	---	---	---	2
WVDP	0.5	---	0.5	---	---	---	0.5
<b>Total</b>	<b>67,000</b>	<b>47,000</b>	<b>114,000</b>	<b>1,700</b>	<b>17,000</b>	<b>18,000</b>	<b>132,000</b>

<sup>a</sup> WIPP, the seventeenth site, does not currently have any TRU waste.

Note: Volume data are rounded from field estimates and columns and rows do not add. Waste volume projections contained in this and other WM PEIS tables were based on 1993 or earlier data and may vary from the latest site estimates at the time of publication.

Source: WM PEIS, Table 8.1-1

### B.3.3 Waste Treatment

There are three alternative waste treatments considered in the WM PEIS: treatment to the Waste Acceptance Criteria (WAC); shredding and using grout; and treatment to the RCRA Land Disposal Restrictions (LDR). Compliance with WAC is the minimum level of treatment required. The shred and grout treatment would be used to further stabilize the waste and reduce the rate of potential gas generation. Treatment to meet LDRs would further stabilize and consolidate waste and destroy volatile organic compounds (VOCs) in the waste. For more information on these treatment technologies, see Chapter 2.

### **B.3.4 Alternatives**

As stated above, the WM PEIS was prepared to support decisions on where to treat and store TRU waste. To assist DOE in making decisions regarding the sites at which it should locate waste management facilities, the WM PEIS considers four categories of alternatives for each waste type: the no action alternative, decentralized alternatives that would minimize the transportation of waste between sites, regionalized alternatives that would locate waste management facilities at several sites throughout the nation, and a centralized alternative that would locate large waste management facilities at only one site for CH-TRU waste and two sites for RH-TRU waste. For TRU waste, DOE considers more than one regionalized alternative in order to vary the number of sites having waste management facilities and the sites at which the facilities could be located. This variation among alternatives allows flexibility when considering the future configuration of waste management facilities. These TRU waste alternatives are summarized in the following subsections. All WM PEIS action alternatives discussed below assume that the waste would be shipped to WIPP for disposal.

#### **B.3.4.1 Decentralized Alternative**

Under the WM PEIS Decentralized Alternative, DOE would, as needed, treat and package TRU waste to meet WAC. The treatment and packaging would occur at all sites. After treatment, CH-TRU waste would be shipped to the nearest one of the 10 sites with the larger amount of TRU waste for storage prior to disposal in WIPP.

#### **B.3.4.2 Regionalized Alternatives**

The WM PEIS regionalized alternatives would consolidate TRU waste for treatment and storage prior to disposal. Three TRU waste regionalized alternatives are analyzed, with varying degrees of treatment at six and four sites, and storage at those sites prior to disposal in WIPP.

##### ***Regionalized 1***

Under the WM PEIS Regionalized 1 Alternative, CH-TRU waste would be shipped from the 10 smallest generators to the four sites with the largest volumes of TRU waste (Hanford, INEEL, LANL, and SRS). In addition, RFETS would continue to treat its own waste, but would not receive waste from off site. RH-TRU waste would be shipped from ANL-E, INEEL, and LANL to Hanford or ORR for treatment. At all six treatment sites, TRU waste would be treated using a shred and grout process (referred to in the WM PEIS as the “reduce gas generation potential”). The six treatment sites proposed under this alternative have 95 percent of current and anticipated TRU waste inventories.

##### ***Regionalized 2***

Under the WM PEIS Regionalized 2 Alternative, DOE would use the same waste consolidation configuration as in Regionalized 1, except that the TRU waste would be treated to meet the LDRs.

##### ***Regionalized 3***

Under the WM PEIS Regionalized 3 Alternative, the consolidation of waste for treatment at four sites (Hanford, INEEL, ORR, and SRS) where approximately 80 percent of TRU waste is already located or is expected to be generated is considered. CH-TRU waste would be treated at

Hanford, INEEL, and SRS; RH-TRU waste would be treated at Hanford and ORR. Under this alternative, TRU waste would be treated to meet the LDRs.

#### **B.3.4.3 Centralized Alternative**

Under the WM PEIS Centralized Alternative, DOE would ship all CH-TRU waste to WIPP for treatment to meet the LDRs and for disposal. RH-TRU waste would be shipped to Hanford and ORR for treatment to meet the LDRs and eventually disposed of in WIPP.

#### **B.3.4.4 No Action Alternative**

Under the WM PEIS No Action Alternative, DOE would continue to characterize, process, and package newly generated TRU waste based on the current WAC for storage at sites where existing or planned facilities are available. DOE would continue to store TRU waste in existing storage facilities for the duration of this analysis (20 years) and would not ship TRU waste for off-site storage; there would be no disposal. All sites are assumed to have adequate capabilities to package and store TRU waste generated in the future. Eleven sites have projected future TRU waste generation, including five sites generating both CH-TRU and RH-TRU waste. The WM PEIS No Action Alternative does not assess the health risks, environmental impacts, or costs of removing TRU waste from retrievable storage and packaging it.

### **B.4 INCORPORATION OF WM PEIS INTO SEIS-II ANALYSES**

WM PEIS analyses form the basis of the SEIS-II analysis of generator site impacts. These impacts, adjusted for different inventories and other analysis assumptions and combined with the SEIS-II analyses of impacts from waste disposal at WIPP and lag storage at the generator sites, present a comprehensive picture of the potential human health impacts complex-wide from management, treatment, and disposal of TRU waste.

The WM PEIS examines potential impacts of management and treatment of the various waste types. Impact areas evaluated in the WM PEIS for all of the waste types include human health risks, air quality, water resources, ecological resources, socioeconomics, land use, environmental justice, infrastructure, cultural resources, and cost.

The relevant portions of the WM PEIS have been summarized and incorporated in SEIS-II. Where appropriate, the WM PEIS impacts have been adjusted to reflect recent information such as revised estimates of future waste generation, cumulative impacts, and potential future activities at the sites. Life-cycle costs and transportation analyses have been reexamined and revised with the results presented in Chapter 5 and methods presented in Appendices D and E, respectively. Human health impacts from the WM PEIS have also been adjusted to reflect waste inventory differences and other factors considered under the SEIS-II alternatives.

For routine operations involving treatment, health impacts in the WM PEIS are evaluated for the off-site population, the on-site worker population not involved in treatment, and waste management workers directly involved in treatment activities. Impacts are quantified using two approaches: analysis of population health risk impacts and analysis of individual health risk impacts. Population impacts focus on the total number of people in each population who may experience adverse health impacts if a particular alternative were implemented.

## **B.5 USING HUMAN HEALTH IMPACTS AT TREATMENT SITES FROM THE WM PEIS**

SEIS-II focuses on impacts from disposal of TRU waste. However, human health impacts from management and treatment of TRU waste at the generator sites, addressed in the WM PEIS, may be a major contributor to the overall risk of disposing of TRU waste and preparing it for disposal.

Overall, in the WM PEIS the numerically largest health risks result from alternatives where TRU waste is treated to meet the LDRs (the WM PEIS Regionalized 2, Regionalized 3, and Centralized alternatives). These alternatives assume the use of thermal destruction of organic waste to meet the LDRs. This treatment method results in emissions of radionuclides that result in additional off-site cancer risks; the maximally exposed individuals (MEI) are at LANL, INEEL, and WIPP. Although postulated waste management worker fatalities primarily result from physical hazards, fatalities are lower when TRU waste is treated to planning-basis WAC or by a shred and grout process than when TRU waste is treated to meet the LDRs.

Because of differences between the WM PEIS and SEIS-II, it was necessary to adjust the impacts from the WM PEIS before they could be used in SEIS-II. SEIS-II analyses use different TRU waste volumes and radionuclide inventories than those in the WM PEIS, and include environmental restoration wastes in the Additional Inventory. SEIS-II alternatives also differ from the WM PEIS by having more years of waste generation and site operation, more sites producing waste, and, in some cases, the waste inventory and the manner of waste consolidation. Human health impacts adjusted from the WM PEIS are those occurring as a result of routine waste treatment and management operations and do not include accidents involving workers or members of the public. Therefore, only those impacts resulting from routine releases and exposure to radioactive material and hazardous chemicals, resulting in potential latent fatal cancers (LCFs) or cancer incidence, respectively, were adjusted.

Radiation-related human health impacts for members of the public and noninvolved workers at the treatment/generator sites were adjusted based on differences in (1) waste volumes treated at the major treatment sites and (2) site-specific concentrations of key radionuclides. These adjustments resulted in a volume ratio (VR) and a concentration ratio (CR), respectively. Radiation-related human health impacts for involved workers and all estimates of cancer incidence from exposure to hazardous chemicals were adjusted only on differences in the waste volumes handled and treated. Key radionuclide and exposure pathway information for involved workers and quantitative hazardous chemical information were not available in the WM PEIS.

Equation B-1 was used to calculate the adjusted radiation dose and LCFs from waste treatment to the off-site population, the MEI, the noninvolved worker population, and the maximally exposed noninvolved worker for the SEIS-II.

$$\text{SEIS-II treatment impact} = \text{VR} \times \text{CR} \times (\text{WM PEIS treatment impact}) \quad (\text{Equation B-1})$$

Equation B-2 was used to calculate the adjusted radiation dose and LCFs for the involved worker population and the hazardous chemical cancer incidence for all populations and individuals.

$$\text{SEIS-II treatment impact} = \text{VR} \times (\text{WM PEIS treatment impact}) \quad (\text{Equation B-2})$$

where

$VR = \text{SEIS-II/WM PEIS waste volume ratio}$

and  $CR = \text{SEIS-II/WM PEIS key radionuclide concentration ratio}$

with both VR and CR varied for each treatment site, alternative, inventory type (Total, Additional, or Basic) and waste type (CH-TRU or RH-TRU). Table B-2 presents the VR and key radionuclide CR for each treatment site, alternative, inventory type (Total, Basic, and Additional) and waste type (CH-TRU and RH-TRU).

Waste volume information for SEIS-II was taken from the “Pre-Treatment Consolidated Volume” columns of Tables A-5 through A-14 of Appendix A. The WM PEIS TRU waste volumes used were those presented in Table B-1 and in Table 8.1-1 of the WM PEIS. The volume ratio calculations were done for each of three SEIS-II inventories: the Basic Inventory, the Additional Inventory, and the Total Inventory except for the Proposed Action and No Action Alternative 2 for which the Basic and Total Inventory are the same (for more information on these inventories, see Chapters 2 and 3 and Appendix A).

Key radionuclides are those defined in Appendix D of the WM PEIS as the single radionuclide contributing the highest risk of latent cancer fatality at each site under each alternative. Key radionuclides contributing the highest risk to off-site populations are listed in WM PEIS Table D.3.4-18 for CH-TRU waste and in WM PEIS Table D.3.4-34 for RH-TRU waste. These key radionuclide concentrations were also used to adjust impacts to the MEI, noninvolved worker population and the maximally exposed noninvolved worker.

Once these key radionuclides were identified, radionuclide concentrations for the SEIS-II alternatives were calculated using the radionuclide inventory and volume data shown in Appendix A. Concentrations were determined by dividing the total activity per year of a particular radionuclide by the total annual volume in cubic meters per year.

The concentrations of the WM PEIS key radionuclides at the various sites were taken from the tables in Appendix B of *Transuranic Waste Inventory, Characteristics, Generation, and Facility Assessment for Treatment, Storage, and Disposal Alternatives Considered in the U.S. Department of Energy Waste Management Programmatic Environmental Impact Statement* (ANL 1995). The tables used for WM PEIS CH-TRU waste radionuclide concentrations were as follows (for an explanation of the SEIS-II alternatives, see Chapter 3 of this document):

Table B-2 was used for the Proposed Action, Action Alternative 1, and No Action Alternative 2

- Table B-3 was used for Action Alternative 3
- Table B-4 was used for Action Alternative 2A and No Action Alternative 1A
- Table B-5 was used for Action Alternative 2B and No Action Alternative 1B
- Table B-6 was used for Action Alternative 2C



**Table B-2**  
**Key Radionuclide Concentration and Volume**  
**Adjustment Factors for CH-TRU and RH-TRU Waste**

Site	Key Radionuclide <sup>a</sup>	SEIS/WM PEIS			
		Concentration Ratio	Volume Ratio		
			Total	Basic	Additional
Proposed Action (Decentralized) <sup>b</sup>					
CH-TRU Waste					
ANL-E	Plutonium-239	0.47	0.21	Same as Total	N/A
Hanford	Plutonium-238	0.26	1.60		N/A
INEEL	Americium-241	1.86	0.77		N/A
LANL	Americium-241	0.07	1.91		N/A
LLNL	Plutonium-239	0.49	0.70		N/A
NTS	Plutonium-239	40.67	1.04		N/A
RFETS	Americium-241	6.72	1.75		N/A
SRS	Plutonium-238	0.25	0.73		N/A
RH-TRU Waste					
Hanford	Plutonium-239	0.14	1.89	Same as Total	N/A
INEEL	Plutonium-241	0.04	3.21		N/A
LANL	Plutonium-239	0.56	2.57		N/A
ORNL	Curium-244	0.42	2.16		N/A
Action Alternative 1 (Decentralized) <sup>b</sup>					
CH-TRU Waste					
ANL-E	Plutonium-239	0.40	0.21	0.21	-- <sup>c</sup>
Hanford	Plutonium-238	0.22	3.34	1.60	1.74
INEEL	Americium-241	1.59	2.26	0.77	1.49
LANL	Americium-241	0.06	3.18	1.91	1.26
LLNL	Plutonium-239	0.42	0.70	0.70	-- <sup>c</sup>
NTS	Plutonium-239	34.41	1.04	1.04	-- <sup>c</sup>
RFETS	Americium-241	6.17	1.75	1.75	-- <sup>c</sup>
SRS	Plutonium-238	0.19	1.02	0.73	0.29
RH-TRU Waste					
Hanford	Plutonium-239	0.22	1.95	1.89	0.07
INEEL	Plutonium-241	0.04	3.93	3.21	0.73
LANL	Plutonium-239	0.56	3.90	2.57	1.33
ORNL	Curium-244	0.42	3.29	2.16	1.13
Action Alternative 2A and No Action Alternative 1A (Regionalized 2) <sup>b</sup>					
CH-TRU Waste					
Hanford	Plutonium-238	0.24	3.22	1.56	1.67
INEEL	Americium-241	1.62	2.25	0.77	1.48
LANL	Americium-241	0.06	3.18	1.91	1.26
RFETS	Americium-241	10.67	1.75	1.75	-- <sup>c</sup>
SRS	Plutonium-238	3.85	0.98	0.72	0.26
RH-TRU Waste					
Hanford	Plutonium-239	1.54	2.04	1.94	0.10
ORNL	Curium-244	0.16	2.71	1.78	0.93

<sup>a</sup> WM PEIS key radionuclides are found in Table D.3.4-18 for CH-TRU waste and in Table D.3.4-34 for RH-TRU waste.

<sup>b</sup> The WM PEIS alternative is shown in parenthesis.

<sup>c</sup> No waste in this inventory.

N/A = Not Applicable

**Table B-2**  
**Key Radionuclide Concentration and Volume**  
**Adjustment Factors for CH-TRU and RH-TRU Waste — Continued**

Site	Key Radionuclide <sup>a</sup>	SEIS/WM PEIS			
		Concentration Ratio	Volume Ratio		
Action Alternative 2B and No Action Alternative 1B (Regionalized 3) <sup>b</sup>					
CH-TRU Waste					
Hanford	Plutonium-238	4.14	Total	Basic	Additional
INEEL	Americium-241	1.29	2.38	1.11	1.27
SRS	Plutonium-238	3.85	0.98	0.72	0.26
RH-TRU Waste					
Hanford	Plutonium-239	1.54	2.04	1.94	0.10
ORNL	Curium-244	0.16	2.71	1.78	0.93
Action Alternative 2C (Centralized) <sup>b</sup>					
CH-TRU Waste					
WIPP	Plutonium-238	1.43	2.41	1.19	1.22
RH-TRU Waste					
Hanford	Plutonium-239	1.54	2.04	1.94	0.10
ORNL	Curium-244	0.16	2.71	1.78	0.93
Action Alternative 3 (Regionalized 1) <sup>b</sup>					
CH-TRU Waste					
Hanford	Plutonium-238	4.14	3.22	1.56	1.66
INEEL	Americium-241	6.16	2.24	0.77	1.46
LANL	Americium-241	16.35	3.18	1.91	1.26
RFETS	Americium-241	0.09	1.75	1.75	
SRS	Plutonium-238	3.85	0.97	0.72	0.26
RH-TRU Waste					
Hanford	Plutonium-239	0.22	2.04	1.94	0.10
ORNL	Curium-244	0.16	2.71	1.78	0.93
No Action Alternative 2 (Decentralized) <sup>b</sup>					
CH-TRU Waste					
ANL-E	Plutonium-239	2.50	0.19	Same as Total	N/A
Hanford	Plutonium-238	4.47	1.26		N/A
INEEL	Americium-241	0.63	0.03		N/A
LANL	Americium-241	16.35	0.91		N/A
LLNL	Plutonium-239	2.39	0.56		N/A
NTS	Plutonium-239	0.03	0.02		N/A
RFETS	Americium-241	0.16	0.96		N/A
SRS	Plutonium-238	4.66	0.55		N/A
RH-TRU Waste					
Hanford	Plutonium-239	0.22	1.89	Same as Total	N/A
INEEL	Plutonium-241	0.01	2.57		N/A
LANL	Plutonium-239	0.89	3.21		N/A
ORNL	Curium-244	0.19	2.16		N/A

<sup>a</sup> WM PEIS key radionuclides are found in Table D.3.4-18 for CH-TRU waste and in Table D.3.4-34 for RH-TRU waste.

<sup>b</sup> The WM PEIS alternative is shown in parenthesis.

<sup>c</sup> No waste in this inventory.

N/A = Not Applicable

The tables used for WM PEIS RH-TRU waste radionuclide concentrations were as follows:

- Table B-8 was used for the Proposed Action, Action Alternative 1, and No Action Alternative 2
- Table B-9 was used for Action Alternative 3
- Table B-10 was used for Action Alternatives 2A, 2B, and 2C and No Action Alternatives 1A and 1B.

The WM PEIS presents only the total site-specific impacts (Volume II; impacts not broken out by CH-TRU or RH-TRU waste) and the total programmatic impact from CH-TRU and RH-TRU waste (Appendix D of the WM PEIS). For most sites, this does not present a problem because most are principally either a CH-TRU or a RH-TRU waste site. For these sites, the impact from CH-TRU and RH-TRU waste was apportioned by the relative volumes of CH-TRU and RH-TRU waste treated at the site. At Hanford, impacts to the offsite population, the MEI, the noninvolved worker population, and the maximally exposed noninvolved worker were apportioned by the differences between the Regionalized 2 and Regionalized 3 alternatives (which have identical human health impacts at Hanford, where both CH-TRU and RH-TRU waste are treated) and the Centralized alternative, where only RH-TRU waste is treated at Hanford. However, under the SEIS-II alternatives, the CH-TRU and RH-TRU waste volumes at Hanford are very similar, and impacts to the involved worker population would be expected to be significantly higher from handling CH-TRU waste than from handling the same volume of RH-TRU waste. Therefore, impacts to the Hanford involved worker population from CH-TRU and RH-TRU waste were apportioned using the ratio of CH-TRU and RH-TRU waste programmatic impacts for each WM PEIS alternative, shown in Appendix D of the WM PEIS (Tables D.3.4-3 and D.3.4-23). Calculated impacts from hazardous chemicals are generally higher from RH-TRU waste than from CH-TRU waste, while radiological impacts are higher from CH-TRU waste than from RH-TRU waste.

No impacts are expected to any of the analyzed groups from exposure to hazardous chemicals; and there is no expectation of LCFs in the MEI, noninvolved worker population, or the noninvolved worker MEI. For RH-TRU waste treatment, there is no expectation of cancer incidence or LCF from exposure to hazardous chemicals or radionuclides. SEIS-II estimates of waste treatment impacts adjusted from WM PEIS human health impacts are principally noted for the off-site populations and for waste treatment worker populations. The adjusted human health impacts from DOE site treatment of CH-TRU and RH-TRU waste are presented by site for each of the SEIS-II alternatives, Total, Basic, and Additional inventories, in [Tables B-3 through B-19](#). Radiation-related LCFs may be expected in the population under Action Alternatives 2A, 2B, and 2C and No Action Alternatives 1A and 1B. There is a calculated expectation of up to 2.4 LCFs for the Total Inventory under Action Alternative 2A and No Action Alternative 1A. Up to 2.3 LCFs may be expected under Action Alternative 2B and No Action Alternative 1B, and about 1 LCF (0.9) may be expected under Action Alternative 2C.

**Table B-3**  
**Human Health Impacts Associated with TRU Waste Treatment**  
**from Radionuclides and Chemicals for the Proposed Action Total (Basic) Inventory**

Site	Contact-Handled (CH-TRU) Waste					Remote-Handled (RH-TRU) Waste					CH-TRU Waste + RH-TRU Waste				
	Population	Maximally Exposed Individual	Noninvolved Worker		Worker Population	Population	Maximally Exposed Individual	Noninvolved Worker		Worker Population	Population	Maximally Exposed Individual	Noninvolved Worker		Worker Population
			Population	Individual				Population	Individual				Population	Individual	
Radiation Dose (in rem or person-rem)															
Hanford	1.9E-02	4.1E-07	9.7E-04	1.6E-06	4.9E+02	4.7E-05	9.9E-10	2.4E-06	4.0E-09	9.0E-01	1.9E-02	4.1E-07	9.7E-04	1.6E-06	5.0E+02
LANL	1.5E-02	1.5E-06	1.3E-03	1.0E-06	6.8E+02	1.3E-03	1.3E-07	1.1E-04	8.5E-08	7.4E+00	1.6E-02	1.6E-06	1.5E-03	1.1E-06	6.9E+02
INEEL	3.2E-03	3.9E-07	9.5E-04	8.1E-07	4.8E+02	4.3E-06	5.2E-10	1.3E-06	1.1E-09	3.2E+01	3.2E-03	3.9E-07	9.6E-04	8.2E-07	5.1E+02
SRS	2.8E-02	2.6E-07	2.9E-03	2.6E-06	1.2E+02	0	0	0	0	0	2.8E-02	2.6E-07	2.9E-03	2.6E-06	1.2E+02
RFETS	2.2E-01	2.9E-06	1.1E-02	6.7E-06	3.3E+01	0	0	0	0	0	2.2E-01	2.9E-06	1.1E-02	6.7E-06	3.3E+01
ORNL	0	0	0	0	0	1.4E-03	4.4E-08	4.8E-05	4.4E-08	1.5E+01	1.4E-03	4.4E-08	4.8E-05	4.4E-08	1.5E+01
LLNL	2.4E-03	3.8E-08	1.2E-04	4.2E-08	9.8E-01	0	0	0	0	0	2.4E-03	3.8E-08	1.2E-04	4.2E-08	9.8E-01
NTS	9.7E-06	2.5E-09	2.7E-05	1.2E-07	5.4E-01	0	0	0	0	0	9.7E-06	2.5E-09	2.7E-05	1.2E-07	5.4E-01
ANL-E	4.0E-04	2.2E-09	2.1E-06	2.1E-09	4.6E+00	0	0	0	0	0	4.0E-04	2.2E-09	2.1E-06	2.1E-09	4.6E+00
Total	2.9E-01		1.7E-02		1.8E+03	2.7E-03		1.6E-04		5.5E+01	2.9E-01		1.8E-02		1.9E+03
Radiation-Related LCFs															
Hanford	9.7E-06	2.0E-10	3.9E-07	6.6E-10	2.0E-01	2.4E-08	5.0E-13	9.4E-10	1.6E-12	3.6E-04	9.7E-06	2.0E-10	3.9E-07	6.6E-10	2.0E-01
LANL	7.5E-06	7.5E-10	5.4E-07	4.1E-10	2.7E-01	6.3E-07	6.3E-11	4.5E-08	3.4E-11	3.0E-03	8.2E-06	8.2E-10	5.8E-07	4.4E-10	2.8E-01
INEEL	1.6E-06	2.0E-10	3.8E-07	3.3E-10	1.9E-01	2.1E-09	2.6E-13	5.1E-10	4.3E-13	1.3E-02	1.6E-06	2.0E-10	3.8E-07	3.3E-10	2.0E-01
SRS	1.4E-05	1.3E-10	1.2E-06	1.0E-09	4.9E-02	0	0	0	0	0	1.4E-05	1.3E-10	1.2E-06	1.0E-09	4.9E-02
RFETS	1.1E-04	1.5E-09	4.4E-06	2.7E-09	1.3E-02	0	0	0	0	0	1.1E-04	1.5E-09	4.4E-06	2.7E-09	1.3E-02
ORNL	0	0	0	0	0	7.2E-07	2.2E-11	1.9E-08	1.8E-11	5.9E-03	7.2E-07	2.2E-11	1.9E-08	1.8E-11	5.9E-03
LLNL	1.2E-06	1.9E-11	4.7E-08	1.7E-11	3.9E-04	0	0	0	0	0	1.2E-06	1.9E-11	4.7E-08	1.7E-11	3.9E-04
NTS	4.9E-09	1.2E-12	1.1E-08	4.9E-11	2.2E-04	0	0	0	0	0	4.9E-09	1.2E-12	1.1E-08	4.9E-11	2.2E-04
ANL-E	2.0E-07	1.1E-12	8.3E-10	8.3E-13	1.8E-03	0	0	0	0	0	2.0E-07	1.1E-12	8.3E-10	8.3E-13	1.8E-03
Total	1.5E-04		7.0E-06		7.3E-01	1.4E-06		6.6E-08		2.2E-02	1.5E-04		7.0E-06		7.5E-01
Chemicals - Cancer Incidence															
Hanford	1.3E-10	0	8.0E-11	1.6E-13	3.5E-08	6.3E-13	0	3.8E-13	7.4E-16	6.4E-11	1.3E-10	0	8.0E-11	1.6E-13	3.5E-08
LANL	1.3E-09	1.6E-13	6.5E-10	4.0E-13	6.6E-08	1.4E-11	1.7E-15	7.0E-12	4.3E-15	7.2E-10	1.3E-09	1.6E-13	6.5E-10	4.0E-13	6.7E-08
INEEL	1.7E-09	2.4E-13	2.3E-09	1.9E-12	6.9E-06	1.2E-10	1.6E-14	1.5E-10	1.3E-13	4.7E-07	1.9E-09	2.6E-13	2.4E-09	2.0E-12	7.4E-06
SRS	1.4E-11	0	6.9E-12	8.0E-15	3.1E-09	0	0	0	0	0	1.4E-11	0	6.9E-12	8.0E-15	3.1E-09
RFETS	8.4E-10	0	1.7E-10	8.6E-14	1.2E-08	0	0	0	0	0	8.4E-10	0	1.7E-10	8.6E-14	1.2E-08
ORNL	0	0	0	0	0	3.5E-07	1.7E-11	1.1E-07	1.1E-10	6.5E-06	3.5E-07	1.7E-11	1.1E-07	1.1E-10	6.5E-06
LLNL	9.1E-08	2.0E-12	2.1E-08	6.3E-12	6.2E-07	0	0	0	0	0	9.1E-08	2.0E-12	2.1E-08	6.3E-12	6.2E-07
NTS	3.9E-13	0	5.3E-12	2.2E-14	9.1E-10	0	0	0	0	0	3.9E-13	0	5.3E-12	2.2E-14	9.1E-10
ANL-E	3.1E-10	0	6.5E-12	5.9E-15	4.0E-10	0	0	0	0	0	3.1E-10	0	6.5E-12	5.9E-15	4.0E-10
Total	9.6E-08		2.4E-08		7.7E-06	3.5E-07		1.1E-07		6.9E-06	4.4E-07		1.4E-07		1.5E-05

**Table B-4**  
**Human Health Impacts Associated with TRU Waste Treatment**  
**from Radionuclides and Chemicals of Action Alternative 1 Total Inventory**

Site	Contact-Handled (CH-TRU) Waste					Remote-Handled (RH-TRU) Waste					CH-TRU Waste + RH-TRU Waste				
	Population	Maximally Exposed Individual	Noninvolved Worker		Worker Population	Population	Maximally Exposed Individual	Noninvolved Worker		Worker Population	Population	Maximally Exposed Individual	Noninvolved Worker		Worker Population
			Population	Individual				Population	Individual				Population	Individual	
Radiation Dose (in rem or person-rem)															
Hanford	3.4E-02	7.2E-07	1.7E-03	2.9E-06	1.0E+03	7.8E-05	1.6E-09	3.9E-06	6.6E-09	9.4E-01	3.4E-02	7.2E-07	1.7E-03	2.9E-06	1.0E+03
LANL	2.1E-02	2.1E-06	1.9E-03	1.4E-06	1.1E+03	1.9E-03	1.9E-07	1.7E-04	1.3E-07	1.1E+01	2.3E-02	2.3E-06	2.1E-03	1.6E-06	1.1E+03
INEEL	8.1E-03	9.9E-07	2.4E-03	2.1E-06	1.4E+03	5.3E-06	6.4E-10	1.6E-06	1.3E-09	3.9E+01	8.1E-03	9.9E-07	2.4E-03	2.1E-06	1.4E+03
SRS	3.0E-02	2.8E-07	3.2E-03	2.8E-06	1.7E+02	0	0	0	0	0	3.0E-02	2.8E-07	3.2E-03	2.8E-06	1.7E+02
RFETS	2.1E-01	2.7E-06	1.0E-02	6.2E-06	3.3E+01	0	0	0	0	0	2.1E-01	2.7E-06	1.0E-02	6.2E-06	3.3E+01
ORNL	0	0	0	0	0	2.2E-03	6.7E-08	7.4E-05	6.7E-08	2.2E+01	2.2E-03	6.7E-08	7.4E-05	6.7E-08	2.2E+01
LLNL	2.0E-03	3.2E-08	1.0E-04	3.5E-08	9.8E-01	0	0	0	0	0	2.0E-03	3.2E-08	1.0E-04	3.5E-08	9.8E-01
NTS	8.2E-06	2.1E-09	2.3E-05	1.0E-07	5.4E-01	0	0	0	0	0	8.2E-06	2.1E-09	2.3E-05	1.0E-07	5.4E-01
ANL-E	3.3E-04	1.8E-09	1.8E-06	1.8E-09	4.6E+00	0	0	0	0	0	3.3E-04	1.8E-09	1.8E-06	1.8E-09	4.6E+00
Total	3.0E-01		1.9E-02		3.8E+03	4.2E-03		2.5E-04		7.4E+01	3.1E-01		2.0E-02		3.9E+03
Radiation-Related LCFs															
Hanford	1.7E-05	3.6E-10	6.8E-07	1.2E-09	4.1E-01	3.9E-08	8.2E-13	1.6E-09	2.7E-12	3.7E-04	1.7E-05	3.6E-10	6.9E-07	1.2E-09	4.1E-01
LANL	1.1E-05	1.1E-09	7.6E-07	5.7E-10	4.5E-01	9.6E-07	9.6E-11	6.8E-08	5.1E-11	4.5E-03	1.2E-05	1.2E-09	8.2E-07	6.2E-10	4.6E-01
INEEL	4.1E-06	4.9E-10	9.6E-07	8.2E-10	5.6E-01	2.6E-09	3.2E-13	6.2E-10	5.3E-13	1.6E-02	4.1E-06	5.0E-10	9.6E-07	8.2E-10	5.8E-01
SRS	1.5E-05	1.4E-10	1.3E-06	1.1E-09	6.9E-02	0	0	0	0	0	1.5E-05	1.4E-10	1.3E-06	1.1E-09	6.9E-02
RFETS	1.0E-04	1.4E-09	4.1E-06	2.5E-09	1.3E-02	0	0	0	0	0	1.0E-04	1.4E-09	4.1E-06	2.5E-09	1.3E-02
ORNL	0	0	0	0	0	1.1E-06	3.3E-11	2.9E-08	2.7E-11	8.9E-03	1.1E-06	3.3E-11	2.9E-08	2.7E-11	8.9E-03
LLNL	1.0E-06	1.6E-11	4.0E-08	1.4E-11	3.9E-04	0	0	0	0	0	1.0E-06	1.6E-11	4.0E-08	1.4E-11	3.9E-04
NTS	4.1E-09	1.1E-12	9.1E-09	4.1E-11	2.2E-04	0	0	0	0	0	4.1E-09	1.1E-12	9.1E-09	4.1E-11	2.2E-04
ANL-E	1.7E-07	9.2E-13	7.0E-10	7.0E-13	1.8E-03	0	0	0	0	0	1.7E-07	9.2E-13	7.0E-10	7.0E-13	1.8E-03
Total	1.5E-04		7.8E-06		1.5E+00	2.1E-06		1.0E-07		2.9E-02	1.5E-04		7.9E-06		1.5E+00
Chemicals - Cancer Incidence															
Hanford	2.8E-10	0	1.7E-10	3.3E-13	7.3E-08	6.6E-13	0	3.9E-13	7.7E-16	6.6E-11	2.8E-10	0	1.7E-10	3.3E-13	7.3E-08
LANL	2.1E-09	2.6E-13	1.1E-09	6.6E-13	1.1E-07	2.1E-11	2.6E-15	1.1E-11	6.6E-15	1.1E-09	2.2E-09	2.6E-13	1.1E-09	6.7E-13	1.1E-07
INEEL	5.1E-09	7.1E-13	6.7E-09	5.5E-12	2.0E-05	1.4E-10	2.0E-14	1.9E-10	1.6E-13	5.7E-07	5.2E-09	7.3E-13	6.8E-09	5.7E-12	2.1E-05
SRS	1.9E-11	0	9.7E-12	1.1E-14	4.3E-09	0	0	0	0	0	1.9E-11	0	9.7E-12	1.1E-14	4.3E-09
RFETS	8.4E-10	0	1.7E-10	8.6E-14	1.2E-08	0	0	0	0	0	8.4E-10	0	1.7E-10	8.6E-14	1.2E-08
ORNL	0	0	0	0	0	5.3E-07	2.7E-11	1.7E-07	1.6E-10	9.9E-06	5.3E-07	2.7E-11	1.7E-07	1.6E-10	9.9E-06
LLNL	9.1E-08	2.0E-12	2.1E-08	6.3E-12	6.2E-07	0	0	0	0	0	9.1E-08	2.0E-12	2.1E-08	6.3E-12	6.2E-07
NTS	3.9E-13	0	5.3E-12	2.2E-14	9.1E-10	0	0	0	0	0	3.9E-13	0	5.3E-12	2.2E-14	9.1E-10
ANL-E	3.1E-10	0	6.5E-12	5.9E-15	4.0E-10	0	0	0	0	0	3.1E-10	0	6.5E-12	5.9E-15	4.0E-10
Total	1.0E-07		2.9E-08		2.1E-05	5.3E-07		1.7E-07		1.0E-05	6.3E-07		2.0E-07		3.2E-05

**Table B-5**  
**Human Health Impacts Associated with TRU Waste Treatment**  
**from Radionuclides and Chemicals of Action Alternative 2A and No Action Alternative 1A Total Inventory**

Site	Contact-Handled (CH-TRU) Waste					Remote-Handled (RH-TRU) Waste					CH-TRU Waste + RH-TRU Waste				
	Population	Maximally Exposed Individual	Noninvolved Worker		Worker Population	Population	Maximally Exposed Individual	Noninvolved Worker		Worker Population	Population	Maximally Exposed Individual	Noninvolved Worker		Worker Population
			Population	Individual				Population	Individual				Population	Individual	
<i>Radiation Dose (in rem or person-rem)</i>															
Hanford	2.6E+02	5.3E-03	1.2E+01	2.2E-02	1.0E+03	4.1E+00	8.5E-05	2.0E-01	3.5E-04	2.0E+01	2.6E+02	5.4E-03	1.3E+01	2.2E-02	1.0E+03
LANL	2.5E+02	2.5E-02	2.3E+01	1.7E-02	1.1E+03	0	0	0	0	0	2.5E+02	2.5E-02	2.3E+01	1.7E-02	1.1E+03
INEEL	5.4E+01	6.5E-03	1.6E+01	1.3E-02	1.3E+03	0	0	0	0	0	5.4E+01	6.5E-03	1.6E+01	1.3E-02	1.3E+03
SRS	1.7E+01	1.6E-04	1.8E+00	1.6E-03	1.9E+02	0	0	0	0	0	1.7E+01	1.6E-04	1.8E+00	1.6E-03	1.9E+02
RFETS	4.1E+03	5.6E-02	2.1E+02	1.3E-01	3.2E+01	0	0	0	0	0	4.1E+03	5.6E-02	2.1E+02	1.3E-01	3.2E+01
ORNL	0	0	0	0	0	4.0E+01	1.2E-03	1.4E+00	1.2E-03	6.2E+02	4.0E+01	1.2E-03	1.4E+00	1.2E-03	6.2E+02
<b>Total</b>	<b>4.7E+03</b>		<b>2.6E+02</b>		<b>3.6E+03</b>	<b>4.4E+01</b>		<b>1.6E+00</b>		<b>6.4E+02</b>	<b>4.7E+03</b>		<b>2.6E+02</b>		<b>4.2E+03</b>
<i>Radiation-Related LCFs</i>															
Hanford	1.3E-01	2.6E-06	5.0E-03	8.7E-06	4.0E-01	2.1E-03	4.3E-08	8.0E-05	1.4E-07	8.1E-03	1.3E-01	2.7E-06	5.0E-03	8.8E-06	4.1E-01
LANL	1.3E-01	1.3E-05	9.2E-03	6.7E-06	4.3E-01	0	0	0	0	0	1.3E-01	1.3E-05	9.2E-03	6.7E-06	4.3E-01
INEEL	2.7E-02	3.2E-06	6.3E-03	5.3E-06	5.2E-01	0	0	0	0	0	2.7E-02	3.2E-06	6.3E-03	5.3E-06	5.2E-01
SRS	8.5E-03	7.9E-08	7.2E-04	6.3E-07	7.4E-02	0	0	0	0	0	8.5E-03	7.9E-08	7.2E-04	6.3E-07	7.4E-02
RFETS	2.1E+00	2.8E-05	8.2E-02	5.0E-05	1.3E-02	0	0	0	0	0	2.1E+00	2.8E-05	8.2E-02	5.0E-05	1.3E-02
ORNL	0	0	0	0	0	2.0E-02	6.1E-07	5.4E-04	4.9E-07	2.5E-01	2.0E-02	6.1E-07	5.4E-04	4.9E-07	2.5E-01
<b>Total</b>	<b>2.3E+00</b>		<b>1.0E-01</b>		<b>1.4E+00</b>	<b>2.2E-02</b>		<b>6.2E-04</b>		<b>2.6E-01</b>	<b>2.4E+00</b>		<b>1.0E-01</b>		<b>1.7E+00</b>
<i>Chemicals - Cancer Incidence</i>															
Hanford	4.2E-10	0	2.4E-10	4.8E-13	5.9E-07	1.1E-12	0	6.1E-13	1.2E-15	1.2E-08	4.2E-10	0	2.4E-10	4.8E-13	6.1E-07
LANL	3.5E-09	4.1E-13	1.7E-09	1.0E-12	1.2E-06	0	0	0	0	0	3.5E-09	4.1E-13	1.7E-09	1.0E-12	1.2E-06
INEEL	3.8E-09	5.1E-13	4.9E-09	4.2E-12	4.9E-05	0	0	0	0	0	3.8E-09	5.1E-13	4.9E-09	4.2E-12	4.9E-05
SRS	2.8E-11	0	1.5E-11	1.7E-14	3.6E-08	0	0	0	0	0	2.8E-11	0	1.5E-11	1.7E-14	3.6E-08
RFETS	1.5E-09	0	3.0E-10	1.5E-13	1.1E-07	0	0	0	0	0	1.5E-09	0	3.0E-10	1.5E-13	1.1E-07
ORNL	0	0	0	0	0	3.0E-07	1.5E-11	1.0E-07	9.5E-11	1.4E-05	3.0E-07	1.5E-11	1.0E-07	9.5E-11	1.4E-05
<b>Total</b>	<b>9.1E-09</b>		<b>7.1E-09</b>		<b>5.1E-05</b>	<b>3.0E-07</b>		<b>1.0E-07</b>		<b>1.4E-05</b>	<b>3.1E-07</b>		<b>1.1E-07</b>		<b>6.4E-05</b>

**Table B-6**  
**Human Health Impacts Associated with TRU Waste Treatment**  
**from Radionuclides and Chemicals of Action Alternative 2B and No Action Alternative 1B Total Inventory**

Site	Contact-Handled (CH-TRU) Waste					Remote-Handled (RH-TRU) Waste					CH-TRU Waste + RH-TRU Waste				
	Population	Maximally Exposed Individual	Noninvolved Worker		Worker Population	Population	Maximally Exposed Individual	Noninvolved Worker		Worker Population	Population	Maximally Exposed Individual	Noninvolved Worker		Worker Population
			Population	Individual				Population	Individual				Population	Individual	
Radiation Dose (in rem or person-rem)															
Hanford	4.4E+03	9.0E-02	2.1E+02	3.7E-01	1.0E+03	4.1E+00	8.5E-05	2.0E-01	3.5E-04	2.0E+01	4.4E+03	9.1E-02	2.1E+02	3.7E-01	1.0E+03
LANL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INEEL	2.5E+02	3.0E-02	7.5E+01	6.3E-02	1.4E+03	0	0	0	0	0	2.5E+02	3.0E-02	7.5E+01	6.3E-02	1.4E+03
SRS	1.7E+01	1.6E-04	1.8E+00	1.6E-03	1.9E+02	0	0	0	0	0	1.7E+01	1.6E-04	1.8E+00	1.6E-03	1.9E+02
RFETS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ORNL	0	0	0	0	0	4.0E+01	1.2E-03	1.4E+00	1.2E-03	6.2E+02	4.0E+01	1.2E-03	1.4E+00	1.2E-03	6.2E+02
Total	4.7E+03		2.9E+02		2.6E+03	4.4E+01		1.6E+00		6.4E+02	4.7E+03		2.9E+02		3.3E+03
Radiation-Related LCFs															
Hanford	2.2E+00	4.5E-05	8.5E-02	1.5E-04	4.0E-01	2.1E-03	4.3E-08	8.0E-05	1.4E-07	8.1E-03	2.2E+00	4.5E-05	8.5E-02	1.5E-04	4.1E-01
INEEL	1.2E-01	1.5E-05	3.0E-02	2.5E-05	5.8E-01	0	0	0	0	0	1.2E-01	1.5E-05	3.0E-02	2.5E-05	5.8E-01
SRS	8.5E-03	7.9E-08	7.2E-04	6.3E-07	7.4E-02	0	0	0	0	0	8.5E-03	7.9E-08	7.2E-04	6.3E-07	7.4E-02
ORNL	0	0	0	0	0	2.0E-02	6.1E-07	5.4E-04	4.9E-07	2.5E-01	2.0E-02	6.1E-07	5.4E-04	4.9E-07	2.5E-01
Total	2.3E+00		1.2E-01		1.1E+00	2.2E-02		6.2E-04		2.6E-01	2.3E+00		1.2E-01		1.3E+00
Chemicals - Cancer Incidence															
Hanford	4.2E-10	0	2.4E-10	4.8E-13	5.9E-07	1.1E-12	0	6.1E-13	1.2E-15	1.2E-08	4.2E-10	0	2.4E-10	4.8E-13	6.1E-07
LANL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INEEL	4.0E-09	5.6E-13	5.4E-09	4.4E-12	7.7E-05	0	0	0	0	0	4.0E-09	5.6E-13	5.4E-09	4.4E-12	7.7E-05
SRS	2.8E-11	0	1.5E-11	1.7E-14	3.6E-08	0	0	0	0	0	2.8E-11	0	1.5E-11	1.7E-14	3.6E-08
RFETS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ORNL	0	0	0	0	0	3.0E-07	1.5E-11	1.0E-07	9.5E-11	1.4E-05	3.0E-07	1.5E-11	1.0E-07	9.5E-11	1.4E-05
Total	4.4E-09		5.6E-09		7.8E-05	3.0E-07		1.0E-07		1.4E-05	3.0E-07		1.1E-07		9.2E-05

**Table B-7**  
**Human Health Impacts Associated with TRU Waste Treatment**  
**from Radionuclides and Chemicals of Action Alternative 2C Total Inventory**

Site	Contact-Handled (CH-TRU) Waste					Remote-Handled (RH-TRU) Waste					CH-TRU Waste + RH-TRU Waste				
	Population	Maximally Exposed Individual	Noninvolved Worker		Worker Population	Population	Maximally Exposed Individual	Noninvolved Worker		Worker Population	Population	Maximally Exposed Individual	Noninvolved Worker		Worker Population
			Population	Individual				Population	Individual				Population	Individual	
<i>Radiation Dose (in rem or person-rem)</i>															
Hanford	0	0	0	0	0	4.1E+00	8.4E-05	1.9E-01	3.4E-04	2.0E+01	4.1E+00	8.4E-05	1.9E-01	3.4E-04	2.0E+01
LANL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INEEL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SRS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RFETS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ORNL	0	0	0	0	0	4.0E+01	1.2E-03	1.4E+00	1.2E-03	6.2E+02	4.0E+01	1.2E-03	1.4E+00	1.2E-03	6.2E+02
WIPP	1.8E+03	4.8E-01	1.4E+02	5.5E-01	9.9E+01	0	0	0	0	0	1.8E+03	4.8E-01	1.4E+02	5.5E-01	7.3E+02
<b>Total</b>	1.8E+03		1.4E+02		9.9E+01	4.4E+01		1.5E+00		6.4E+02	1.8E+03		1.5E+02		1.4E+03
<i>Radiation-Related LCFs</i>															
Hanford	0	0	0	0	0	2.0E-03	4.2E-08	7.8E-05	1.4E-07	8.1E-03	2.0E-03	4.2E-08	7.8E-05	1.4E-07	8.1E-03
LANL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INEEL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SRS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RFETS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ORNL	0	0	0	0	0	2.0E-02	6.1E-07	5.4E-04	4.9E-07	2.5E-01	2.0E-02	6.1E-07	5.4E-04	4.9E-07	2.5E-01
WIPP	9.0E-01	2.4E-04	5.8E-02	2.2E-04	4.0E-02	0	0	0	0	0	1	0	0	0	2.9E-01
<b>Total</b>	9.0E-01		5.8E-02		4.0E-02	2.2E-02		6.2E-04		2.6E-01	9.2E-01		5.9E-02		5.5E-01
<i>Chemicals - Cancer Incidence</i>															
Hanford	0	0	0	0	0	1.6E-10	0	9.5E-11	1.9E-13	3.5E-09	1.6E-10	0	9.5E-11	1.9E-13	3.5E-09
LANL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INEEL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SRS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RFETS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ORNL	0	0	0	0	0	3.0E-07	1.5E-11	1.0E-07	9.5E-11	1.4E-05	3.0E-07	1.5E-11	1.0E-07	9.5E-11	1.4E-05
WIPP	1.3E-09	5.1E-13	6.7E-10	3.1E-12	6.4E-05	0	0	0	0	0	1.3E-09	5.1E-13	6.7E-10	3.1E-12	6.4E-05
<b>Total</b>	1.3E-09		6.7E-10		6.4E-05	3.0E-07		1.0E-07		1.4E-05	3.0E-07		1.0E-07		7.8E-05



**Table B-8**  
**Human Health Impacts Associated with TRU Waste Treatment**  
**from Radionuclides and Chemicals of Action Alternative 3 Total Inventory**

Site	Contact-Handled (CH-TRU) Waste					Remote-Handled (RH-TRU) Waste					CH-TRU Waste + RH-TRU Waste				
	Population	Maximally Exposed Individual	Noninvolved Worker		Worker Population	Population	Maximally Exposed Individual	Noninvolved Worker		Worker Population	Population	Maximally Exposed Individual	Noninvolved Worker		Worker Population
			Population	Individual				Population	Individual				Population	Individual	
Radiation Dose (in rem or person-rem)															
Hanford	1.1E+00	2.3E-05	5.3E-02	9.2E-05	1.0E+03	1.5E-04	3.0E-09	7.2E-06	1.2E-08	1.1E+01	1.1E+00	2.3E-05	5.3E-02	9.2E-05	1.1E+03
LANL	6.7E+00	7.2E-04	6.2E-01	4.6E-04	1.1E+03	0	0	0	0	0	6.7E+00	7.2E-04	6.2E-01	4.6E-04	1.1E+03
INEEL	3.9E-02	4.9E-06	1.2E-02	1.0E-05	1.4E+03	0	0	0	0	0	3.9E-02	4.9E-06	1.2E-02	1.0E-05	1.4E+03
SRS	1.0E+00	9.4E-06	1.1E+00	9.4E-05	1.9E+02	0	0	0	0	0	1.0E+00	9.4E-06	1.1E+00	9.4E-05	1.9E+02
RFETS	4.9E-03	6.6E-08	2.5E-04	1.5E-07	3.3E+01	0	0	0	0	0	4.9E-03	6.6E-08	2.5E-04	1.5E-07	3.3E+01
ORNL	0	0	0	0	0	7.4E-04	2.2E-08	2.5E-05	2.3E-08	1.9E+01	7.4E-04	2.2E-08	2.5E-05	2.3E-08	1.9E+01
Total	8.8E+00		1.8E+00		3.8E+03	8.9E-04		3.2E-05		3.0E+01	8.8E+00		1.8E+00		3.8E+03
Radiation-Related LCFs															
Hanford	5.4E-04	1.1E-08	2.1E-05	3.7E-08	4.2E-01	7.3E-08	1.5E-12	2.9E-09	4.9E-12	4.5E-03	5.4E-04	1.1E-08	2.1E-05	3.7E-08	4.2E-01
LANL	3.3E-03	3.6E-07	2.5E-04	1.9E-07	4.5E-01	0	0	0	0	0	0	0	0	0	4.5E-01
INEEL	2.0E-05	2.4E-09	4.7E-06	4.0E-09	5.5E-01	0	0	0	0	0	0	0	0	0	5.5E-01
SRS	5.1E-04	4.7E-09	4.3E-04	3.7E-08	7.4E-02	0	0	0	0	0	0	0	0	0	7.4E-02
RFETS	2.5E-06	3.3E-11	9.9E-08	6.0E-11	1.3E-02	0	0	0	0	0	0	0	0	0	1.3E-02
ORNL	0	0	0	0	0	3.7E-07	1.1E-11	9.9E-09	9.1E-12	7.5E-03	3.7E-07	1.1E-11	9.9E-09	9.1E-12	7.5E-03
Total	4.4E-03		7.1E-04		1.5E+00	4.4E-07		1.3E-08		1.2E-02	4.4E-03		7.1E-04		1.5E+01
Chemicals - Cancer Incidence															
Hanford	4.2E-10	0	2.5E-10	5.1E-13	3.5E-07	1.1E-12	0	6.4E-13	1.3E-15	3.7E-09	4.2E-10	0	2.5E-10	5.1E-13	3.5E-07
LANL	3.0E-09	6.6E-13	1.5E-09	9.5E-13	4.7E-07	0	0	0	0	0	3.0E-09	6.6E-13	1.5E-09	9.5E-13	4.7E-07
INEEL	5.1E-09	7.0E-13	6.8E-09	5.7E-12	3.3E-05	0	0	0	0	0	5.1E-09	7.0E-13	6.8E-09	5.7E-12	3.3E-05
SRS	3.0E-11	0	1.5E-11	1.8E-14	2.1E-08	0	0	0	0	0	3.0E-11	0	1.5E-11	1.8E-14	2.1E-08
RFETS	1.1E-09	0	2.3E-10	1.1E-13	3.7E-08	0	0	0	0	0	1.1E-09	0	2.3E-10	1.1E-13	3.7E-08
ORNL	0	0	0	0	0	4.3E-07	2.2E-11	1.4E-07	1.4E-10	9.2E-06	4.3E-07	2.2E-11	1.4E-07	1.4E-10	9.2E-06
Total	9.6E-09		8.8E-09		3.4E-05	4.3E-07		1.4E-07		9.2E-06	4.4E-07		1.5E-07		4.3E-05